THE SCHOBER REVERBATAPE® UNIT RV-3A

SERVICE MANUAL

In a complex device like the Reverbatape Unit it is always possible that something may not work right upon completion of the kit. This Service Manual is designed to help you find and correct any trouble. If you have a problem, go through this manual carefully; the chances are that you will find what is wrong. However, if you still cannot cure the difficulty, or if you would like some information not covered here or in some other Schober literature, don't hesitate to write.

If you do write to us, the following points will help us to help you in the shortest possible time and with the maximum efficiency and accuracy.

1. Start by stating the Schober Organ model or other organ or equipment with which you are using the Unit. Be quite specific about the application if it is not for a Schober Organ—make and model of organ or other equipment, your mode of connection if not specified by Schober, and anything else pertinent to the installation.

2. Describe the symptoms of the trouble in as much detail and with as many facts as you can muster. *Do not try to be brief!* Even things you may not think important or even relevant may be very helpful. Describe what *does* work as well as what does not. *Leave nothing out.* For example, suppose the symptom is "no reverberation," but everything else seems normal—the motor is running and tape moving, direct signal is present, etc. Tell us all this in addition to the fact that you get no reverberation.

3. If you can beg, borrow, or kidnap a typewriter, please use it—and don't worry about whether your typing looks professional. So few people are masters of Spencerian script that we cringe whenever we get a longhand letter. When our eyes can range freely over your typed thoughts, our brains and intuition work accurately and at speed. When we have to decode letter by letter, we can't concentrate on your problem—and by the time we finish one paragraph we can't remember what was in the last. If you really must hand-write, please strive for maximum clarity!

4. If you find words inadequate to make your points clear—sounds are often hard to describe—a tape recording can help. If you make a tape on a stereo machine, begin by erasing *all tracks on the entire tape.* Then record *only on the upper track.* Only use 7½ or 15 inches per second—the fastest speed of which your machine is capable. Record the tape *in one direction only.* If you don't follow these rules we cannot play your tape and you will have wasted a lot of time.

Servicing Procedure

Two principal causes are responsible for almost all malfunctions: errors in construction and defective parts. Fortunately, because of the nature of solid-state electronics and the conservative Schober design practices, once any initial problems are cleared up it is unlikely that any future trouble will plague you. If you do have trouble at the start, therefore, you should not take that to mean the Reverbatape Unit is inherently troublesome and will later fail in service. It only means that humans can make mistakes. So don't be surprised if some troubleshooting is necessary. Once it is over you will probably never have trouble again.

Defective parts are a very small percentage of all parts, but they can exist because 100% inspection of all components would be prohibitively expensive. The defects are not visible and must be discovered by testing. We have actually done this testing for you by deliberately putting bad parts in selected positions in a laboratory Reverbatape Unit. Each such bad part produces a recognizable symptom. We have listed a large number of symptoms in this manual. If you recognize your symptom in the list, the note following it will tell you what is wrong and what to do. Defective parts can also often be discovered by voltage measurements. If you have a d.c. voltmeter, preferably a vacuum-tube voltmeter (VTVM) rather than a voltohmmeter (VOM), though the latter can be of some help if it is rated 20,000 ohms or more per volt, the voltage tables later in this manual can help after you exhaust the list of symptoms.

Construction errors take several forms. You may have *failed to do something,* such as soldering a connection or even inserting a wire or component. You may have *done something wrong,* like connecting a wire or component at the wrong place or interchanging two wires or components. You may have *done something you shouldn't,* like connecting together two points which should have remained separate. You may have decided *not to follow the instructions literally,* believing something was intended but not said, or that you know better how Schober kits should be assembled than we do.

You may have been guilty of *poor soldering.* Plain bad soldering should by now be well in your past—things like not keeping the iron in place long enough to get good heat or not applying enough solder. But anyone can accidentally make a *solder bridge,* allowing solder to flow between two copper points on a printed board so as to connect them when they should remain separate. Solder bridges can be found by carefully comparing the copper side of your board with the illustration of it in the assembly instructions, Fig. 3. If you find any place where solder connects two points but the drawing shows no black line making the same connection, you are guilty. Wipe off your soldering iron and use it to pick up the solder. You can be sure you had a bridge if you see brown insulating board where the solder was. However, if the solder simply covered copper, you had no bridge, since there is no objection to having solder over copper even when it is not needed to make a connection.

Sometimes—though very, very seldom—a copper line on a printed circuit can actually have a break, so that it does not carry current. Usually this comes from a hard scratch, and sometimes it may be hard or impossible to see with the naked eye. It can be found by measuring from one end of the line to the other with an ohmmeter or your Organ Tester. The meter should show zero ohms or the Tester should show continuity (buzz stops). If you find or suspect a copper break, coat the copper line with solder—but be careful not to slop on enough solder to make an accidental bridge to some other copper point while you are doing it.

As a last preliminary step in looking for trouble, *use your eyes.* Look over the printed board very carefully, point by

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295

point, and test each component by trying to move it lightly with your fingers. You may find a connection that was not soldered!

Fig. 1 is a drawing of the mechanism with all the parts identified. Fig. 2 is a complete and correct schematic diagram of the RV-3A Reverbatape Unit.

Servicing The Mechanism

Servicing should rarely if ever be required on the mechanism, and attempts at repair or adjustment generally do more harm than good. If you are sure the mechanism is at fault, return it to the factory for service. Such service is prompt and charges are small.

The bearings of the rotating parts are porous bronze. They carry an absorbed quantitiy of lubricant in the pores of the bronze and additional lubrication should almost never be necessary. Lack of lubrication is usually indicated by squeaking sounds. If this occurs, *a drop* of light machine oil may be placed on the felt washers in front of the rubber roller and brass inertia wheel. Be very careful to use very little oil, as too much may come out and start dripping when the Unit heats up in normal operation. Be very certain oil is needed before applying it. Normally, thousands of hours of operation pass before lubrication is necessary.

From time to time it is necessary to clean deposits of magnetic oxide from the magnetic heads and other parts of the machine. Also, cleaning a few hours after a new tape loop has been installed may be necessary.

In determining whether the mechanism is running correctly it is normal to hold a steady tone on the organ and listen for excessive wow or flutter (slow or fast pitch waver, respectively) with the Control advanced to 7 or more. Under these conditions, however, note that you will not get a *perfectly* steady tone. The brass inertia wheel has deliberately been held to a smaller size than would assure perfectly steady tape speed. What remains is a small amount of random speed variation whose function is to give to the normally rock-steady electronic tones a small amount of "pitch movement" to achieve the warmth and the "human" quality found in the tones of orchestral players and air-blown pipes.

The pitch variations heads should not, however, be obtrusively cyclic—steady, repetitive pulsations—as this would indicate wow which is not normal. Neither should they be at a high speed rate equivalent to the rate of rotation of the motor shaft. If they are, it is likely that the flywheel is loose on the rear shaft of the motor. Tichtening the flywheel setscrew will correct this.

Cleaning And Tape Replacement

WARNING: Do not attempt to replace the tape with any-

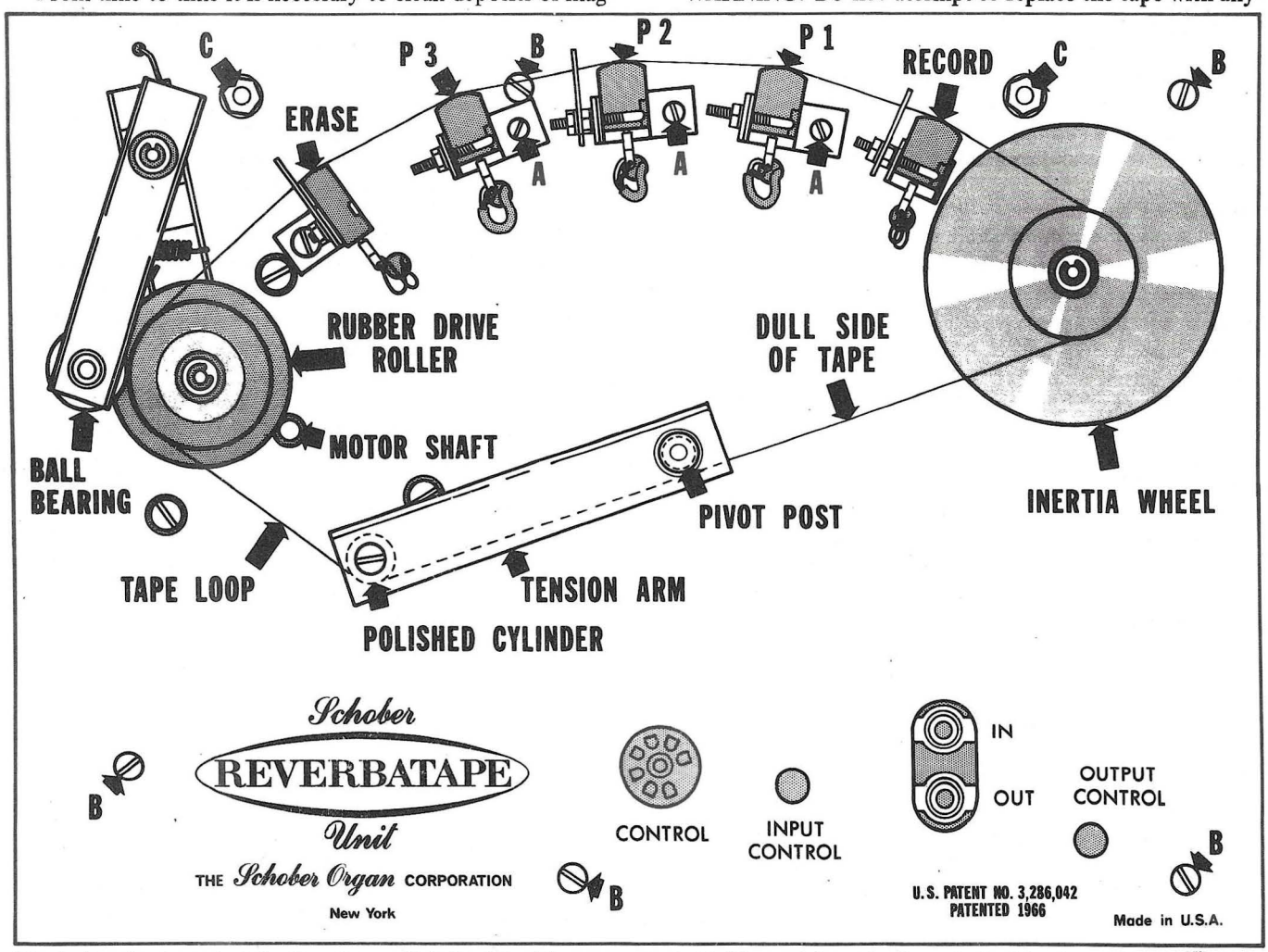

Fig. 1—The front panel of the Reverbatape Unit RV-3A with parts marked. P1, P2, and P3 are the three playback heads and the A screws are for adjusting their azimuth for high-frequency alignment. The five B screws go into the tubular spacers mounted on the printed circuit, to hold the circuit board to the front panel. The two C screws (as well as the one holding the tension arm center post) are used to hold the Plexiglas front panel cover, which is not shown here, in place. This drawing shows exactly how the tape loop is mounted. It runs counterclockwise.

thing but a new Schober Tape Loop TL-3. Use of any other tape, or resplicing a broken Schober tape with splicing tape in the conventional manner, may clog the magnetic heads or otherwise prevent proper operation. Another type of tape will almost certainly upset calibration.

The Schober Tape Loop TL-3 is made of a very special tape on which the magnetic oxide is held in an exceptionally strong binder. The wearing away of the oxide during the life of the tape is a very slow process, and when it does come off it "dusts" instead of forming a "gunk." This prevents lost oxide from clogging the heads and gumming up other parts of the machine. The oxide dust will stay on areas of the upper faces of the magnetic heads that the tape does not contact. However, unless there is an enormous buildup of oxide, none will remain where the tape actually touches the head face at the gap or working area.

The tape loops are treated with a special lubricant for long life. This treatment may give some areas on the tape an oily appearance. This is normal. The treatment *is not oil. Do not try to wipe it off.*

The splice in the tape is made by a special "welding" process which, unlike splicing tape, does not increase the thickness of the tape at the splice point and will not gradually pull apart or "cold flow" due to the constant tension on the tape. The tape is smooth and not stiffened at the splice point, so that it flows through the machine as though it were made as one continuous loop. (To our knowledge, no tape manufacturer is actually able to make an endless loop.) The oxide at the splice point is smooth and continuous, minimizing the possibility of a "dropout" every time the splice passes over the magnetic heads.

A Tape Loop TL-3 will, under normal circumstances, operate without deterioration in sound quality or effect on calibration for up to about 500 hours, sometimes more. Each machine is supplied with a box of extra loops along with a sheet of instructions titled, "Preparing Your Reverbatape Unit." This sheet tells you how to install the tension arm, which cannot be shipped in place on the Unit, and how to install a tape loop when necessary.

NOTE: The tape loop already in place on a new Unit is a good one. *Do not replace it.*

There is only one really good way to know when the machine needs cleaning and/or tape replacement. That is when the reverberation time is obviously shorter than it used to be or there is regular and excessive pitch variation ("wow") when steady tones are held. At this point the machine should be cleaned. The magnetic heads and other metal parts may be cleaned with denatured alcohol, head cleaner such as Ampex Head Assembly Cleaner 087-007, or FilMagic Long Life Cleaner (red solution) *without getting any liquid on the tape.* Denatured alcohol and the Long Life Cleaner may also be used to clean the rubber drive roller but the Ampex cleaner must not be used on rubber.

After cleaning, test the machine, *using the old tape.* Excessive pitch variation, if present prior to cleaning, should be gone. If normal reverberation is restored you can continue to use the old tape. However, if reverberation time is still short, install a new tape.

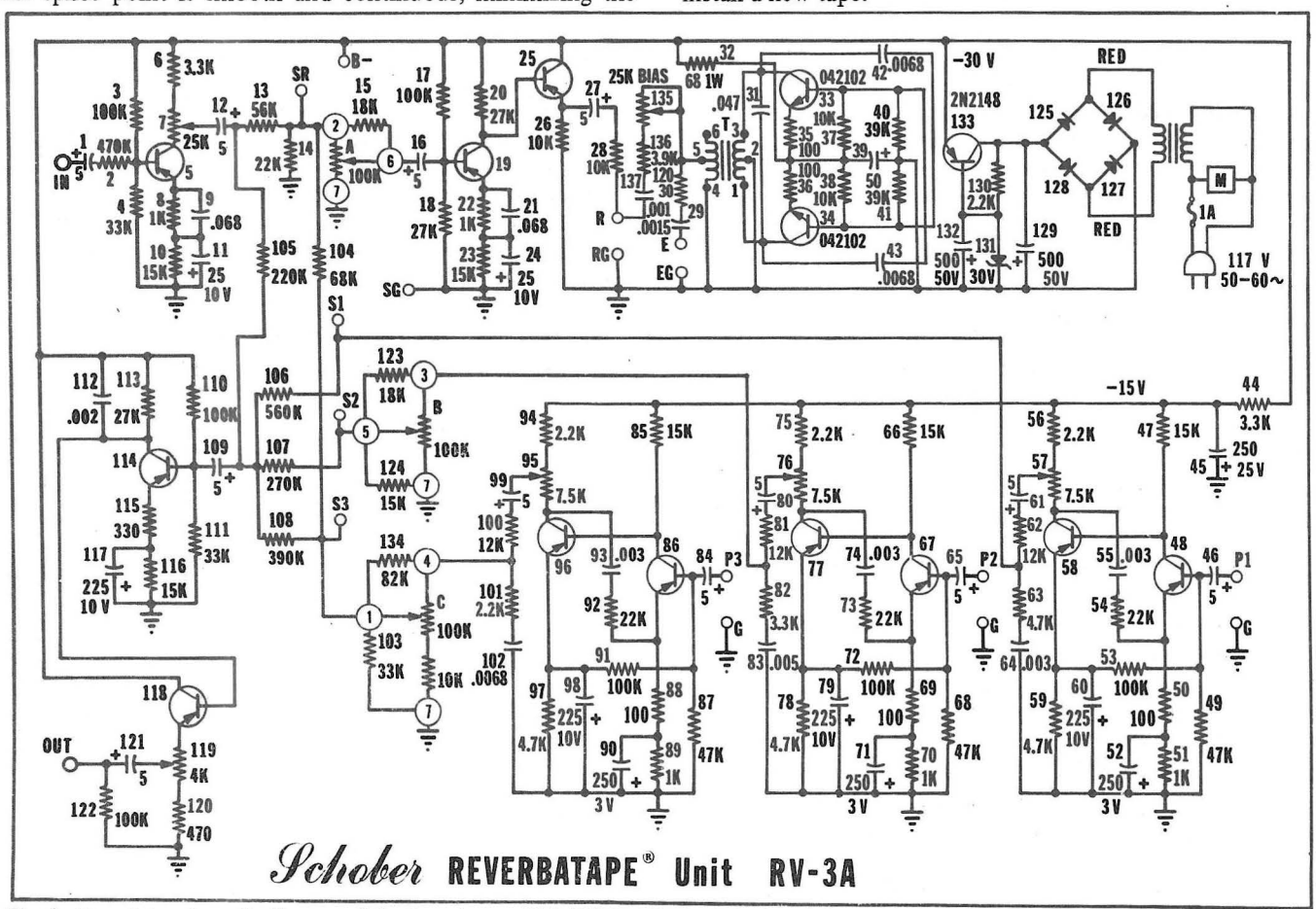

Fig. 2—Complete schematic diagram of the Reverbatape Unit RV-3A. Controls A, B, and C are the three-gang Reverbatape Control, C being the one closest to the Control shaft. The circled numerals at the terminals of these controls refer to the numbers of the cable-end plug and CONTROL socket pins to which these terminals are connected, and also to the cable wire colors according to the resistor color code.

Whenever you install a new tape, let the machine run for about 30 minutes to give the special lubricant in the tape a chance to smooth out. During this period the sound may be a bit erratic or "gravelly."

The tape loop you find on a new machine has been run for at least 30 minutes and is thus already broken in.

Except for the oily looking areas, the *oxide face* of a new tape is *dull* brown. This is the face which must contact the heads. After a few hours of use the oxide becomes darker and shinier; it may even look shinier than the other tape face. This does not mean the tape is bad; it is really better than new. *A shiny tape is a good tape.*

Oxide is gone from a tape only when the tape becomes transparent. After long operation a transparent streak may appear parallel to the tape edge. This streak is always outside the working area and does not matter. *A tape with a transparent line near one edge is still a good tape.*

After a period of operation oxide dust eventually appears at various points. *Do not clean the machine just because you see oxide dust.* Let excessive pitch variation or loss of reverberation time be your only criteria.

Remember: Do not judge by the tape's appearance or the presence of oxide dust that a tape needs replacement. Judge only by *performance.* You simply cannot tell the condition of a tape loop by looking at it—unless, of course, there is obvious physical damage such as breaking, tearing, or severe creasing, etc.

If you have occasion to remove the tape temporarily and replace it without referring to the separate sheet, "Preparing Your Reverbatape Unit," be sure that the oxide surface of the tape is against the magnetic heads. It may be hard to tell which side is which if the tape has been used for some time and is well polished. However, if you install it wrong, the giveaway will be complete lack of reverberation.

If you happen to own a head demagnetizer and/or a bulk eraser, occasional use of these devices will keep down noise, as with any tape machine. When using the head demagnetizer remove the tape and keep it several feet away. When bulk-erasing the tape, do so at a distance from the machine.

Voltage Measurements

As in any electronic equipment, electronic faults can often be located by voltage measurements. Before checking voltages, however, try to find the trouble by using the trouble-shooting list which forms the last part of this manual.

The following table gives normal voltages at each element of each small transistor. D.c. voltages are all *negative* with respect to ground (the steel box) and should be measured with a vacuum-tube voltmeter or one of the new solid-state meters having input resistance of several megohms. If a meter not having tubes or transistors is used, many voltages will appear to be lower than they actually are. With any kind of meter, allow as much as ±20% tolerance before deciding that a reading indicates something is wrong.

NOTE: If the Reverbatape Unit is turned on with the printed circuit detached from the front wall of the steel box, its ground connection has been removed. To restore it, use a cliplead to connect the tubular spacer nearest the Control socket to the steel box.

You cannot reach the transistor terminals on the painted side of the circuit board, and it is difficult to identify them on the copper side. To read voltages, therefore, you should touch your probe to component wires rather than directly to the transistor socket terminals. The third column of the table shows which wire of which component is connected to which terminal of which transistor.

For example, the first line of the table refers to the emitter (E) of transistor 5. The third column lists component 8T. This means that if you face the *painted* (noncopper) side of the printed circuit, with the lettering reading normally, the probe of your voltmeter will read the emitter voltage of transistor 5 if it is touched to the top (T) wire of component 8 (which happens to be a resistor). R, L, and B mean, of course, *right, left,* and *bottom.* The positive voltmeter lead should be clipped to the steel box.

If you do wish to touch your negative meter lead directly to a transistor element on the *copper* side of the board, Fig. 3 shows how the terminals are laid out.

Before using the voltage table, see that the power supply voltage, measured at the right wire of resistor 44, is between

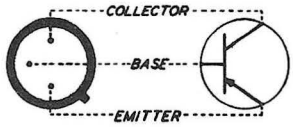

Fig. 3—The three connections of a small transistor socket, viewed from the copper side of the printed circuit, showing emitter (E), base (B), and collector (C) terminals. The schematic symbol identifies the elements for those unfamiliar with transistors.

−28 and −32. If it is not, check to see that the zener diode voltage, measured at the bottom of capacitor 132, is between −28 and −32, and that the rectifier voltage, measured on the metal case of the power transistor 133, is about −50 volts. The latter voltage was measured at a line voltage of 120 and will be less if your line voltage is less than 120.

If you cannot obtain these power supply voltages, check transformer secondary voltage. This *a.c.* voltage should be about 37 (again less if your line voltage is below 120), measured between the two board terminals to which the red transformer wires are connected. If you disconnect the red wires from the board and measure voltage between the wires, you should find about 47.

Any power supply voltage discrepancy must be corrected before doing further measurement or service work.

The voltages in the table are based on a power supply voltage of −30 at the right wire of resistor 44. If that voltage is higher (it may be as much as −32) or lower (as little as −28) expect other voltages shown to be correspondingly different.

TRANSISTOR	ELEMENT	COMPONENT	VOLTAGE
5	E	8T	− 7.8
	B	2R	− 7.9
	C	7T*	− 6.7
19	E	22L	− 6.7
	B	17L	− 6.8
	C	20L	−18.8
25	E	27R	−18.8
	B	20L	−18.8
	C	17R	−30.0
48	E	50T	− .81
	B	53T	− .94
	C	47T	− 3.5
58	E	60T	− 3.3
	B	47T	− 3.5
	C	54B	− .81

*These components are potentiometers having four prongs going into the circuit board. Use the *upper small prong* in each case.

TRANSISTOR	ELEMENT	COMPONENT	VOLTAGE
67	E	69T	– .81
	B	72T	– .94
	C	66T	– 3.5
77	E	79T	– 3.3
	B	66T	– 3.5
	C	73B	– 8.1
86	E	88T	– .81
	B	91T	– .94
	C	85T	– 3.5
96	E	98T	– 3.3
	B	85T	– 3.5
	C	92B	– 8.1
114	E	115R	– 7.4
	B	110B	– 7.5
	C	113R	–17.2
118	E	119T*	–17.1
	B	113R	–17.2
	C	113L	–30.0
34	E	36T	–20.8
	B	41T	–24.4
	C	43T	0†
33	E	35B	–20.8
	B	40B	–24.4
	C	42B	0†

Bias-Erase Oscillator

In some cases it may be helpful to know the a.c. bias-erase voltages. To measure them you need a voltmeter whose frequency response is flat to at least 60 kc, which is the approximate oscillator frequency. An a.c. VTVM is desirable but the a.c. ranges of a multipurpose VTVM are satisfactory if frequency response is adequate. If you do not get the specified voltages, be very sure the fault is not in your meter before concluding there is something wrong with the Unit.

The usual VTVM has a shielded "hot" lead, and the capacitance between wire and shield will reduce voltage readings. You must therefore use separate, unshielded ground and "hot" meter leads. The ground lead should be attached to the steel Reverbatape Unit box for these readings.

The voltage at 30L (left wire of component 30) should be between 26 and 30. At E (an erase head terminal) voltage should be between 37 and 53. Nominal value is about 46 but any voltage in the range given is acceptable. At R (a record head terminal) the reading can be as low as 3.5 volts at minimum setting of bias control 135 and as high as 19.5 volts with maximum setting. With correct final adjustment of this control according to the installation instructions, the reading at R should be between 10 and 13 volts.

RECALIBRATION

"How The Schober Reverbatape Unit Works" explains why the outputs from the three playback heads must always bear a certain relationship to that from the direct channel. This calibration of the playback amplifiers is made with the three potentiometers 57, 76, and 95 to compensate for the manufacturing tolerances in the magnetic heads.

It is very unlikely that any change in calibration will be needed unless one of these potentiometers has accidentally been turned or the magnetic heads are replaced. Reduced reverberation time almost invariably means worn tape or dirty heads—not a need for recalibration. Recalibration usually does more harm than good.

WARNING: Do not attempt recalibration or any adjustment whatsoever of potentiometers 57, 76, and 95, unless you are certain beyond a doubt that the Unit absolutely requires it. Unless you are very knowledgeable, such assurance usually can come only through the manufacturer's advice, in which case you are usually much better off sending the Unit back for factory recalibration. If you do decide to attempt the job, do it only if you are technically knowledgeable and have all the equipment specified below. Possessing the knowledge and equipment, however, and having decided for some good reason to recalibrate, you can safely assume that precise compliance with the following instructions will yield a good job, as no magic is involved.

Recalibration Equipment

You need the following equipment: A signal generator capable of closely controlled, stable output up to 1 volt rms at frequencies of 100 and 6,000 cps; a reasonably accurate a.c. voltmeter with at least 5,000 ohms per volt sensitivity; and two shielded cables, each having a phono plug at one end to fit into the Unit's IN and OUT jacks.

Decibel Readings

For maximum convenience the voltmeter should be calibrated in decibels. They need not be dbm, only relative decibels. If you have db calibrations, check before using them to see that they agree with the following mathematical derivation.

Meters without decibel calibrations can be used with the aid of a few simple calculations, made before beginning. With the available meter select a range on which 1 volt or less would deflect the meter well past center scale or even off scale. For example, you could select 1 volt on a 1.5-volt scale or 0.2 volt on a 0.3-volt scale, etc.

In all the following instructions this selected voltage is referred to as *0 db.*

Multiply the selected voltage by 0.9. The result is referred to as –1 db. (For instance, if 0.2 volts is 0 db, –1 db is .18 volt.)

Multiply the selected voltage by 0.8; the result is referred to as –2 db. (For 0 at 0.2 volt, –2 would be .16 volt.)

Multiply the selected voltage by 0.7; the result is –3 db.

Greater accuracy than this is not required.

Treble Alignment

In tape mechanisms it is always important to align the tape head gaps laterally to obtain the best high-frequency response, and this is done at the factory by turning the screws marked A in Fig. 1 and/or bending the brackets holding the heads to the box. In the Reverbatape Unit this alignment is less important than in the usual tape recorder since the highs are deliberately sloped off in the electronics to give less reverberation time at the treble, for best realism.

In the alignment procedure below, the adjustment of each of the three calibrating potentiometers is preceded by high-frequency alignment of that head. To do this, switch the oscillator to 6,000 cps and gently move the head right and left with a finger to see whether the output meter reads any higher. If it does, loosen or tighten the A screw as necessary to get the highest reading, then go on to the calibration after switching back to 100 cps. If the A screw is to be loosened it

†There is actually a very slightly negative voltage at each of these points, but it is virtually unreadable on the usual VTVM.

295

is generally necessary to bend the mounting bracket slightly to bias the head to the left, then bring it back to maximum reading by slowly tightening the screw.

If there is no reason to suppose that treble alignment has been destroyed (as it might be by physical accident, for instance) we recommend omitting the treble alignment.

Calibration Procedure

Before alignment clean the head gaps with cotton or a soft cloth saturated in alcohol or head cleaner. *Do not let any liquid get on the tape.* Clean also the rubber drive roller and the motor shaft, using only denatured alcohol or Long Life cleaner.

In the following steps the meter readings (decibels) which should appear at each point are indicated, as well as the potentiometer which makes the adjustment. The meter readings for the tape head outputs will not be steady. Accept the highest reading over a period of several seconds. If actual readings are within about ½ db or so it is not necessary to change any adjustments.

Check off each step as you complete it.

☐ **1.** Remove the following transistors, quickly located with the chart pasted to the bottom of the box: 58, 77, and 96.

☐ **2.** Unsolder one wire of resistor 104 from its tubular terminal and see that it cannot touch the terminal.

☐ **3.** Connect the test signal generator to the Unit's IN jack and set it at 100 cps.

☐ **4.** Turn the OUTPUT CONTROL 119 to maximum (clockwise as you face the front of the Unit) and the INPUT CONTROL to minimum (counterclockwise).

☐ **5.** Connect the Unit's line cord to the power line and see that the tape moves normally.

☐ **6.** Connect your a.c. voltmeter to the OUT jack.

☐ **7.** Adjust oscillator output until the meter reads the voltage you selected as 0 db in the "Decibel Readings" section of this manual. This must be no more than 1 volt.

☐ **8.** Unsolder one wire of resistor 105 from its terminal. Plug the Reverbatape Control into the CONTROL socket and set it at its clockwise maximum.

☐ **9.** Replace transistor 58. For high-frequency alignment of playback head 1 (P1 in Fig. 1) set the oscillator at 6,000 cps *without changing its output adjustment* and adjust the head, if necessary, as described under "Treble Alignment." You can switch to a different meter scale if you wish, to get a more useful reading.

☐ **10.** Return the oscillator to 100 cps and your meter to the original selected range. Now adjust potentiometer 57 for a reading of −1 db.

☐ **11.** Remove transistor 58 (but keep it identified as 58 so you will eventually return it to the 58 socket) and insert 77. Check playback head 2 treble alignment. Then, with the oscillator at 100 cps, adjust potentiometer 76 for −2 db.

☐ **12.** Remove 77 (but keep it identified) and insert 96. Check playback head 3 treble alignment. Then, with the oscillator at 100 cps, adjust potentiometer 95 for −3 db. Be especially careful with this adjustment. *The meter must not go higher than (greater voltage than) −3 db at any time.*

☐ **13.** Replace transistors 58 and 77 into their original sockets and resolder the free ends of resistors 104 and 105 into their terminals.

The Reverbatape Unit is now ready for use. After installation in organ or audio system the INPUT and OUTPUT controls must, of course, be adjusted in accordance with the installation instructions. The bias potentiometer 135, however, should not be touched.

TROUBLESHOOTING

The remainder of this manual contains a list of symptoms and probable cures. Each symptom is printed in bold type. If a particular symptom matches your case, take the action indicated by the explanation printed in ordinary type.

The list is in two sections. The first pertains to problems which are primarily electronic, and the second to mechanical problems. Under many symptoms you will find several possible cures. These are listed in order of probability and/or ease, so far as possible. You should therefore try the cures in the order given.

Each symptom is an isolated case and is assumed to be the only one that exists. However, it is obviously possible that there may actually be two or more unrelated problems giving several independent symptoms. Tackle each problem separately.

Each cure assumes that just one component is at fault. It is possible, though most improbable, that more than one of the cures listed under a single symptom may be necessary. For this reason, as you work down the list of cures for a particular symptom, replacing the components called for, do not undo your curative work just because the symptom remains. If, for example, the first listed cure tells you to replace a capacitor, and the trouble remains after you have put in a new capacitor, leave the new capacitor in when you go on to the next cure. Even if the second listed suggestion cures the trouble, the first capacitor might just have been bad, too.

The cures calling for component replacements assume that you do not have the test equipment needed to determine whether the mentioned parts are actually bad; this is why simple replacement is called for. However, even an ohmmeter is adequate to check most parts. To check a part, disconnect at least one of its wires from the board. Check each part once; then reverse the connections to the ohmmeter and check again.

A shorted capacitor shows low or zero ohms for both tests and so does a **shorted diode.** An **open diode** shows infinite resistance for both tests. A **good diode** shows a few ohms one way, infinite resistance the other. With the ohmmeter set to a high range, a **good capacitor** usually makes the meter kick a little as you reconnect the meter leads after reversing them. However, a capacitor which does not do this is not necessarily bad, especially if its value is small. A **good electrolytic capacitor** (capacitor with value of 2 mfd or more) shows relatively small resistance measured one way, higher and slowly rising resistance the other.

It is always possible that you can run into a symptom or combination of them which cannot be solved with the list. In that case, call on Schober for help. And if you happen to find a symptom and/or cure that ought to be in the list, we'll appreciate being notified so we can add it.

If you have a voltmeter you can check voltages with the information given previously. You should do this *after* checking symptoms and only if necessary. The last several symptoms in the Electronic section are those which most likely give no audible clue (though they may) and therefore can be detected or confirmed positively only with a VTVM or oscilloscope. These rarely occur; they are listed for those who happen to have test equipment and discover one of these

symptoms in the course of using it. Should one of the components involved here actually be defective and go undiscovered indefinitely, no harm whatever can result. This is true because of the generous design margin in these circuits.

Be careful when unsoldering anything. Melt the solder thoroughly while the piece is being removed. Restore the hole in the board by heating the solder and twirling an ordinary nail (or anything to which solder will not adhere) in the hole until the solder hardens. Treat the copper gently, since its ability to adhere to the board is reduced while it is hot. If any ever does come off you can always make a repair by using solder or by soldering in place a bit of bare wire.

One last general hint. Check polarity of electrolytic capacitors (those with values of 2 mfd or more). If the end marked POSITIVE or + is not actually toward the + marks on the board, circuit operation will certainly be impaired. Check diodes and rectifiers, too, for backwards insertion, referring to the assembly instructions.

If your Reverbatape Unit has a Two-Channel Adapter and you think it may be involved in a problem, refer to the Adapter instructions.

Electronic Malfunctions

Special Note: Where the diagnosis mentions an "open" component, the same effect would be obtained if the component were perfectly good but not well soldered. Before replacing it, therefore, check its solder connections. If the connections are good, go ahead and replace the component. However, if you find one of its connections is badly soldered (or not soldered at all!) making a good solder joint should fix the trouble and the component need not be replaced.

If the suggested cure specifies replacing a transistor, and the replacement does not cure the trouble, inspect the solder joints for the three prongs of the socket. Failure to solder one of them well, or accidentally soldering two of them together may have caused the trouble. Also check the socket for broken terminals.

1. Output distorted at high volume and high settings of the Reverbatape Control.

INPUT CONTROL adjusted too high. See installation instructions.

2. Excessive background noise.

INPUT CONTROL setting too low.

3. Excessive background noise. Cannot obtain distortion point as specified in adjustment procedure.

A. Insufficient signal level from source. Replace R2 with 100,000 ohms. If no results use a jumper wire in place of R2.

B. Capacitor 11 open. Replace.

4. Very low output. Unit otherwise normal.

Capacitor 117 open. Replace.

5. No reverberation, no direct signal; very low or no background noise is present.

A. Transistor 114 open or shorted. Replace. If no results, check socket for poor connections, solder bridges, broken terminals. Check transistor for bent-over or missing wires.

B. Transistor 118 open or shorted. If no results, make the same checks as in A above.

C. Potentiometer 119 open. Check solder connections; if good, replace potentiometer.

D. Capacitor 121 open. Replace.

E. Capacitor 112 shorted. Replace.

F. Capacitor 117 shorted. Replace.

6. No reverberation, no direct signal. Normal background noise is present.

A. Transistor 5 open or shorted. Replace.

B. Capacitor 12 open. Replace.

C. Capacitor 1 open. Replace.

D. Potentiometer 7 open. Replace.

E. Capacitor 109 open. Replace.

F. Capacitor 11 shorted. Replace.

7. Unit produces no sound whatever. Power transformer very hot. Transistor 133 is cold.

Capacitor 129 shorted. Replace.

8. Unit produces no sound whatever. Transistor 133 is cold and power transformer is between cold and barely warm.

A. Zener diode 131 incorrectly installed. Reverse.

B. Zener diode 131 shorted. Replace.

C. Capacitor 132 shorted. Replace.

D. Transistor 133 open. Check tightness of mounting screws. If no use, replace transistor.

E. Power transformer open. Replace.

9. Soft buzzy hum. Power transformer overheats quickly and gives off smoke and an acrid odor.

One or more of the rectifiers 125, 126, 127, 128 shorted. Replace.

10. Loud buzz.

Capacitor 129 open. Replace.

11. Extremely loud hum.

Transistor 133 shorted. Replace.

12. No reverberation, but direct signal is present.

A. Transistor 19 or 25 open or shorted. Replace.

B. Capacitor 16 open. Replace.

C. Capacitor 27 open. Replace.

D. Capacitor 24 open or shorted. Replace.

E. Capacitor 45 shorted. Replace.

13. No reverberation. Direct signal is present, plus thumps, pops, or rushing sounds.

A. Transistor 33 or 34 shorted. Replace *with 2N2102.*

B. Capacitor 31 open or shorted. Replace.

C. Capacitor 42 or 43 shorted. Replace.

D. Capacitor 27 shorted. Replace.

14. No reverberation. Resistor 32 smokes and burns. Direct signal is present and you may also hear pops, bangs, and other odd noises.

Capacitor 39 shorted. Replace 39 and 32.

15. Excessive hiss accompanied by soft hum.

Capacitor 132 open. Replace.

16. Soft low-frequency hum. Changes when Unit is moved or turned.

Unit is too close to hum-producing equipment such as power supplies, amplifiers, etc. Place Unit as far as possible from such equipment.

17. Excessive hiss at any setting of the Control.

One (or more) of transistors 5, 114, 118, 19, 25, 48, or 58 is noisy. Replace one at a time until noise reduces.

18. Excessive hiss only at high settings of the Control.

One (or more) of transistors 67, 77, 86, 96, 19, 5, or 25 is noisy. Replace one at a time until noise reduces.

19. Excessive hiss and possibly regular thumping at high settings of the Control.

Heads have been magnetized. Use a head demagnetizer. Remove tape before demagnetizing heads. Head magnetization can be caused by locating Unit too close to a strong permanent magnet such as those used in Loudspeakers.

20. Noisy Control action.

A. Capacitor 16 shorted. Replace.

B. Capacitor 12 shorted. Replace.

21. INPUT and OUTPUT controls make scratchy noise when rotated. (Potentiometers 57, 76, and 95 sound scratchy when rotated during recalibration.)

Normal condition because d.c. is carried by these controls. This does not cause noise during operation. Ignore.

22. Transistors 33 and 34 feel very hot and transistor 133 is warm.

Normal condition. These are power transistors and are built to dissipate heat.

23. Roaring oscillation commences as soon as Unit is turned on with Control set at maximum.

Capacitor 21 shorted. Replace.

24. Oscillation or rumbling builds up gradually when Control is turned to maximum.

A. Capacitor 29 open. Replace.

B. Unit out of calibration. Turn potentiometer 95 *very slowly* counterclockwise until rumbling just stops. If this works, the Unit should be recalibrated. However, you may find the reverberation effect is satisfactory, without any irregular small jumps in volume as a sound dies away, in which case you can get by without recalibration.

C. Erase head is misaligned. Request Schober Information Bulletin BN-004.

25. Unit oscillates with Control at maximum. With Control fully off there are pops, bangs, thumps, and possibly repetitions of signals previously played.

A. Erase head cable is disconnected or loose at erase head prongs or at board terminals.

B. Erase head cable is shorted. Check both ends to see that wires are not touching. See that cable is not crushed between motor shield and inside front surface of steel box. See step 74 of the Assembly Instructions.

26. Reverberation time is too short at maximum Control setting.

A. Unit needs cleaning.

B. Bias control 135 is set incorrectly. See installation instructions.

C. Tape loop worn out. Replace.

D. Capacitor 45 open. Replace.

E. Unit out of calibration.

27. Reverberation is very faint relative to direct signal. Bias control 135 has no effect.

A. Capacitor 137 open. Replace.

B. Potentiometer 135 open. Replace.

28. Both reverberation and direct signals deficient in treble. Organ sounds duller and less brilliant than before installation of the Reverbatape Unit.

Capacitor 9 shorted or open. Replace.

29. Excessive treble. Sound is more brilliant than before the Reverbatape Unit was installed. There may be excessive hiss.

Capacitor 112 open. Replace.

30. Direct signal is normal, but reverberations lack treble. Decaying sound is dull and muted.

Capacitor 21 open. Replace.

31. Reverberation decay is bumpy and uneven under all conditions because one of the playback heads produces no signal.

A. First determine which head is at fault. Remove transistors 58, 77, and 96, and unsolder one end of resistor 105. While feeding signal through Unit, replace 58 to check playback head 1. If you hear signal, remove it and put in 77 to check head 2. If you hear signal, remove 77 and insert 96 to test head 3. If one head provides noticeably weak signal, see symptom 32. If one produces no sound at all, try the following cures B through H.

B. Head cable is disconnected, loose, or broken at one end or the other, or inner wire is shorted to shield. Fix.

C. Transistor 48 or 58 for head 1, 67 or 77 for head 2, or 86 or 96 for head 3 open or shorted. Replace.

D. Open capacitor 61 for head 1, 80 for head 2, or 99 for head 3. Replace.

E. Open capacitor 52 for head 1, 71 for head 2, or 90 for head 3. Replace.

F. Open or shorted capacitor 46 for head 1, 65 for head 2, or 84 for head 3. Replace.

G. Open or shorted capacitor 60 for head 1, 79 for head 2, or 98 for head 3. Replace.

H. Open potentiometer 57 for head 1, 76 for head 2, or 95 for head 3. Before replacing, make every possible effort to check with an ohmmeter *without changing potentiometer settings* to see whether resistance reading between a large side tab and a small prong is infinite, meaning replacement is required. *Replacing one of these potentiometers means the Unit must be recalibrated.*

32. Playback head 1, 2, or 3 produces weak (but not zero) signal.

A. Use the procedure A under symptom 31 to determine which head is at fault. Then try B through E below.

B. Unit may need cleaning, especially the weak head.

C. A calibration potentiometer, 57 for head 1, 76 for head 2, or 95 for head 3, may have accidentally been turned. If so, black dots on the control, placed there after factory calibration, do not align. Rotate serrated wheel until dots align.

D. Shorted capacitor 64 for head 1, 83 for head 2, or 102 for head 3. Replace.

E. Shorted capacitor 55 for head 1, 74 for head 2, or 93 for head 3. Replace.

33. Playback head 1, 2, or 3 produces excessively loud signal, and black dots show that calibration potentiometers are still at factory settings. Or during recalibration procedure one head cannot be turned down to the correct meter reading, even with potentiometer fully counterclockwise.

Open capacitor 55 for head 1, 74 for head 2, or 93 for head 3.

NOTE: Symptoms 34 through 37 can be detected or positively confirmed only with instruments. There is *usually* no audible effect.

34. Excessive bias-frequency signal in output. This may produce a whistle on the tape when the Unit is used to feed a tape recorder, due to beating between Unit and tape recorder bias frequencies. There can be no other bad effects. Since the normal bias-frequency content at the output is only about .02 volt even with maximum settings of the bias control, it cannot cause a following amplifier to overload.

A. Capacitor 39 may be open. Replace.

B. Where some following equipment is extremely sensitive to bias frequency in an unusual installation, a simple filter can be obtained from Schober to get rid of practically all traces of bias signal.

35. Bias voltage is low. Transistor 33 or 34 remains cold after several minutes of operation. There may be a faint, regular thump in the output.

A. Transistor 33 or 34 open. Replace *with 2N2102.*

B. Capacitor 42 or 43 open. Replace.

36. Low erase voltage at erase head terminals. Nominal is

about 46 volts; may be between 37 and 53. Voltmeter must be flat to at least 60 kc.

Capacitor 29 shorted. Replace.

37. Voltage between right wire of 44 and box too high, nearly the same as on the case of 133. (Should be −28 to −32.)

Zener diode 131 open. Replace.

Mechanical Malfunctions

38. Very deep and erratic wavering in pitch; excessive mechanical vibration.

A. Oil on rubber drive roller and motor shaft. Remove the drive roller and clean all surfaces with denatured alcohol or Long Life cleaner (red solution). Clean motor shaft. Reinstall drive roller.

B. Bent motor shaft. Replace motor.

39. Rhythmic waver in pitch (wow).

A. Tape surface of inertia wheel (Fig. 1) and/or tape and drive surfaces of rubber drive roller are dirty. Clean with denatured alcohol or Long Life. *Keep liquid off tape.*

B. Screw holding ball bearing in place is rubbing on large rim of rubber drive roller. *Slightly* bend arm away from chassis.

C. Ball bearing does not turn freely. Replace.

D. Insufficient oil in bearings. Add *one drop* of light oil (such as "3 in 1") to each felt washer. Run Unit for a while to work oil into bearings. **WARNING**: Do not add oil unless obviously necessary. A bearing needing oil often squeaks.

40. Motor runs but tape does not travel.

A. Rubber drive roller not in contact with motor shaft. Push roller arm toward motor shaft. If condition persists place *one tiny drop* of oil at each of the four phenolic washers on pivot shaft. Use a needle to apply the oil.

B. Tape not in correct position on mechanism. See Fig. 1.

C. Rubber drive roller and motor shaft oily or dirty. Follow A under symptom 38.

41. Very fast flutter.

A. Setscrew of flywheel on rear motor shaft is loose.

B. Bent motor shaft. Replace motor.

REVERBATAPE UNIT RV-3A SERVICE MANUAL

CHANGE NOTICE

Before using the attached Reverbatape Unit Service Manual (24RVSMA3), make the following changes in the text:

A. On the schematic diagram, page 3, change component values in accordance with the following table:

NUMBER	NEW VALUE	NUMBER	NEW VALUE
26	3300	53	68,000
136	1200	72	68,000
30	100	91	68,000
4	47,000	32	10
17	82,000	29	.01
110	150,000		

B. On the schematic diagram make a notation that transistors 5, 19, 25, 114, 118 are 045000 and that transistors 48, 58, 67, 77, 86, and 96 are 045000W white-marked.

C. In the voltage table, pages 4 and 5, change voltages in accordance with the following table:

TRANSISTOR	ELEMENT	COMPONENT	VOLTAGE
5	B	2R	-8.2
5	C	7T	-16.7
19	B	17L	-7.1
25	E	27R	-18.5
48	B	53T	-1.2
58	B	47T	-3.8
58	C	54B	-8.1
67	B	72T	-1.2
77	B	66T	-3.8
86	B	91T	-1.2
96	B	85T	-3.8
114	B	110B	-7.8
118	E	119T	-16.8